animals require iron, I have seen mules licking rusty iron, just as thousands of people have seen horses licking salt," to which valuable testimony he quotes an account of quails in Florida picking at the holes in the steel rails.

But to appreciate fully what a man of blood and iron we are concerned with, it is necessary to obtain some insight into his views of what his plants and animals do with these relatively enormous quantities of the metal.

We read on p. 5, "iron is the means of fixing the ammonia of the air in the soil to form nitrates. In any case I am sure there is a fixed law by which the ammonia of the air is fixed in the soil to form nitrates . . . ." Then, on p. 21, "it has been proved over and over again that iron is fatal to all fungi, consequently it is unreasonable to suggest that bacteria would attack a perfectly healthy animal, and destroy the blood containing a constituent which was a poison to them."

And, again, on pp. 98–99, "The distinct chemical difference between fungi and what we look upon as ordinary plants, is that the fungi contain no iron or nitrogen, while these constituents are essential to ordinary plant life. It is known that iron and nitrogen are fatal to fungi, therefore the more iron and nitrogen animal life takes up in its food the more likely it is to be immune to bacterial diseases."

It might not unreasonably be expected that we had here plumbed the depths, but the following shows that there are nether regions still, for on p. 42 we have the astounding statement, "It is fully recognised that iron and nitrogen in combination with the phosphates are the means by which the plant is enabled to take up the carbon of the air, . . ." and on p. 68, "it is admitted that the proteids are fatal to pathogenic bacteria." Even these are not the only contributions of the author to the study of bacteria, for he states (p. 98) "it is recognised that all classes of bacteria can only live on foods corresponding in chemical composition to themselves," which pronouncement would appear to require some explanation in view of the previous one regarding proteids, for instance, and the following, quoted from p. 33:—"it is admitted that pathogenic bacteria cannot live in the presence of proteids."

What the author's idea of a proteid may be we have been unable to make out, but there is no hesitation needed in regard to some of his notions regarding immunity, of which the following is a specimen (p. 60):—"Another important factor in immunity is electricity, which is so closely connected with the chemistry of the animal that it is reasonable to think that an animal of normal chemical combination will be in a position to produce much more electricity than an animal chemically deficient."

Immunity is a fascinating but a very difficult subject, but the author is not deterred by the latter in his submission to the former attribute.

On pp. 118–119 we read, "although Storer does speak of the better kinds of humus, yet it may be a chlorotic humus, or it may be a humus containing a maximum chlorophyll, or any variation between the two, which variation would be capable of constituting a great chemical difference." Indeed, we should think it would! But let us read on (p. 120), "if you have a field rich in all the essential mineral constituents, in an assimilable form, and a green crop be grown in this field and ploughed in, and then a cereal crop be grown, this cereal crop will be immune to rust, to say nothing of other parasitical diseases." Here it might be said that the author is merely claiming that high manuring renders a crop more immune, did not the context show that his ideas are by no means so simple, and if the continuation on p. 120 were overlooked, "while if in another field, very deficient in these assimilable mineral constituents, a green crop was grown of a chlorotic nature and ploughed in, then the cereal crop grown would not be immune owing to the imperfect chemical functions performed by what I may call a chlorotic humus."

And this, after all the careful work that has been done on the cereal rusts and other parasitic diseases!

On p. 131 the author declares that "parasitic fungi and bacteria can only flourish when the plant (or animal) on which they feed is deficient in chlorophyll or chlorophyll matter, or their products."

An interesting specimen of the author's quality appears in the following naïve passage on p. 148:—"Slugs, indeed, living as they do like the fungi mainly upon decaying vegetable matter, are not unlike creeping fungi, and I believe it can be shown that they are chemically of a similar composition." Again, p. 158:—"I have now pointed out that there are forms of insect life that are to all intents and purposes simply an extension of the fungi."

These suggestive quotations will, we are of opinion, convince the reader that the present volume cannot be said to be of any use to a serious student of science.

MINES AND MINERALS OF THE UNITED STATES.

Mineral Resources of the United States. Calendar Year 1901. Pp. 973 and index. (Washington: Government Printing Office, 1902.)

THIS is the eighteenth volume of the well-known series issued by the United States Geological Survey, and, like those which have gone before, it is full of valuable information concerning the mineral output not only of the country itself, but also of the world generally. The book consists of a number of articles written by various experts; thus the production of iron ore is dealt with by Mr. Birkinbine, and the American iron trade by Mr. Swank. Mr. G. F. Kunz contributes some interesting pages upon precious stones, whilst the coal trade is reviewed by Mr. E. W. Parker. The consequence is that a more useful contribution to knowledge is made by the United States Geological Survey than by the British Home Office in its annual mineral statistics.

The introductory remarks written by Dr. David T. Day tell us that the total value of the minerals produced in 1901 is reckoned at 1,086,529,521 dollars, or about 223 millions sterling; this is more than twice the value of the mineral output of the United Kingdom last year. It must be pointed out, however, that the

American figures are swollen by taking the value of the metals and not the value of the ores, but even if the comparison with this country were made upon strictly identical lines, we should still be a long way behind.

In 1901 the United States produced more coal, copper, gold, iron, lead, salt and silver than any other country in the world. The yield of coal was about one-third of the world's supply. This mineral is mined in twenty-eight different States, Pennsylvania being, of course, by far the most important. Twenty-four States are producing iron ore, Minnesota heading the list with 11 million tons of red hæmatite.

Montana yields about two-fifths of the copper of the United States, the Lake Superior district about one-quarter, and Arizona about one-fifth.

Colorado has outstripped California, and is now the leading gold-producing State.

Mr. Oliphant's chapter upon natural gas is sure to claim much attention, and is of special import for those who are interested in our new supply in Sussex. The advantages of this cheap and economical fuel are lauded to the skies by the author, who reckons that the quantity tapped and supplied in 1901 exceeded one cubic mile in volume; 21,848 miles of mains, 2 to 36 inches in diameter, are employed in distributing the gas to consumers.

We learn from Mr. Struthers that the United States are the largest producers of borates in the world. Most of the borax is obtained by treating the colemanite of California.

According to Mr. Joseph Hyde Pratt, who deals with abrasives, artificial corundum is now being employed in the manufacture of emery wheels. It appears that bauxite is converted into corundum by means of great heat and pressure in an electrical furnace. The mineral monazite is far more widely distributed than was imagined when its name was chosen in allusion to its supposed rare occurrence; it derives its commercial value from the small percentage of thoria which it contains. The quantity washed from gravels and sands in North and South Carolina in 1901 amounted to 334 tons.

In dealing with a great work like the volume under review, it may seem ungenerous to point out a small and trifling error, but probably Mr. Birkinbine will be glad to correct the statement that "no true manganese ore is won" in Great Britain. The Merionethshire ore cannot be fairly described as "manganiferous iron ore" when an analysis [1] shows 25 per cent. of manganese and only 4 per cent. of iron.

CLIMATOLOGY.

Handbook of Climatology. Part i. General Climatology. By Dr. Julius Hann. Translated by Robert de Courcy Ward. Pp. xv + 437. (London: Macmillan and Co., Ltd., 1903.) Price 12*s.* 6*d.* net.

THE translation into English of the first volume of Dr. Hann's "Climatologie" is a very welcome addition to the library of English-speaking meteorologists. The translation does not extend to the last two volumes of the original work, which deal with special climatology, as it has been found "impracticable" to translate them. This is greatly to be regretted, for the generalisations which constitute the science of climatology cannot be satisfactorily treated without reference to the statistical data and the means for verifying them. Moreover, a compendious review, in English, of the statistics of the various meteorological elements arranged according to geographical distribution is constantly wanted for many purposes, and either a translation of Dr. Hann's volumes, or a reproduction in an abridged form of Dr. Buchan's volume of the *Challenger* reports, is a necessity of which every student of meteorology must be aware. It is quite true that such a survey would be a work of reference, and would not serve as a text-book in a course of general climatology, and as that is Prof. Ward's purpose in preparing the translation, we must unfortunately wait for some other interest to prompt the translation of the two volumes of special climatology.

The translator himself explains the relation of the English version to Hann's first volume:—

"This translation, as it stands, essentially reproduces the original. Numerous references, especially such as will be most useful to English and American students, have been added, and changes have been made in the text in order to bring the discussion down to date. A natural temptation to expand the original has been yielded to in very few cases only. Practically all of the important publications which have been issued since the completion of the second German edition are referred to. Some new examples of different climatic phenomena have been added, chiefly from the United States. Most of the examples given, however, necessarily still relate to Europe, because the climatology of that continent has been studied more critically than that of any other region. A few cuts have been made where the discussion concerned matters of special interest to European students only."

Among recent works, references to which have been incorporated, Bartholomew's "Atlas" is conspicuous, but the remarkable Russian "Climatological Atlas," published in 1900, is not, although it furnishes a large number of illustrations of climatological principles.

A distinction is drawn by Hann between climatology and meteorology, but when one deals with general climatology it is rather hard to maintain the distinction. In dealing with the analysis of climates into solar, or mathematical climate, and physical climate, with such subdivisions as mountain climate, continental and marine climates, forest climate, and such supplements as mountains as climatic barriers, geological changes of climate and periodic variations of climate, all of which are treated in the book, it is obvious that neither author nor translator would be content with the mere analysis of figures representing these different sections. The mode of classification at once suggests the causes of climate, and the investigation of such causes is practically general meteorology.

It is scarcely necessary to refer to the admirable way in which Dr. Hann arranged his introductory volume to include a survey of all the general facts about climate and its local variations, and to produce a book

[1] Halse, "On the Occurrenee of Manganese Ore in the Cambrian Rocks of Merionethshire." (*Proc.* N.E. Inst. M. and M. Eng., vol. xxxvi. 1887).